ORION Power Systems

Online Pro
Intelligent True On-Line UPS

User Manual

1K/1.5K/2K/3KVA

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1. Important Safety Instructions

1.1. *An Important Notice*

SAVE THESE INSTRUCTIONS - This Manual Contains Important Instructions that should be followed during Installation and Maintenance of the UPS

1. No user serviceable parts inside – opening case will void the warranty.
2. Do not try to repair the unit yourself; contact your local supplier or your warranty will be void.
3. If liquids are spilled onto the UPS or foreign objects dropped into the unit, the warranty will be void.
4. Do not install the UPS in an environment with sparks, smoke or gas.
5. This UPS is equipped with an EMI filter. To prevent a potential current leakage hazard, ensure that the AC main supply is securely grounded.
6. This UPS is designed to be installed and operated in a sheltered, controlled environment as follows:
   - Operating temperature 0-40°C and 30-90% non-condensing humidity.
   - Always avoid contact with direct sunlight.
   - Install the UPS in a non-flammable and non-hazardous environment.
   - Dusty, corrosive, and salty environments can do damage to any UPS.
   - Install the UPS indoors only - it is not designed for outdoor operation.
7. To prevent overheating of the UPS, keep all ventilation openings free from obstruction, and do not place anything on top of the UPS. Keep the UPS rear panel 8 inches away from the wall or other obstructions.
8. The batteries will discharge naturally if the system is unused – keep UPS plugged into wall to maintain batteries.
9. Install the UPS away from objects that give off excessive heat and areas that are excessively wet.
10. Always switch off the UPS and disconnect the batteries when relocating the UPS.
11. Batteries should be recharged every 2-3 months if the UPS is being stored. If the batteries are not recharged, the warranty will be void. When the UPS is installed and in use, the batteries will be automatically recharged and kept in top condition.

12 Make sure that the AC Utility outlet is correctly grounded.

13. Please ensure that the input voltage of the UPS matches the utility supply voltage. Use a certified input power cable with the correct plugs and sockets for the appropriate voltage system.
14. The UPS is intended for installation in a temperature-controlled, indoor area free of conductive contaminants.
15. Maximum ambient temperature 40°C

1.2. *Storage Instructions*

For extended storage in a moderate climate, the batteries should be charged for 12 hours every 3 months by connecting the UPS to the utility supply and switching on the input breaker located at the UPS rear panel. Repeat this procedure every 2 months if the storage ambient temperature is above 30°C.

2. Product Introduction

2.1. *General Characteristics*

True online technology continuously supplies your critical devices with a stable, regulated, transient-free pure sine wave AC Power.

1. High-efficiency PWM sine-wave topology yields an excellent overall performance. The high crest factor of the inverter handles all high in-rush current loads without the need to upgrade the power rating.

2. User-friendly Plug-and-Play design allows hassle-free installation. All units up to 3Kva are supplied with input cables and output sockets as standard.

3. Built-in Maintenance-free sealed-type battery minimizes the need for frequent service.

4. To protect the unit from overloading, the UPS will automatically switch to bypass mode in 30 seconds if loading is at 105%~ 120% of rated capacity. It will automatically switch back to inverter mode once overload condition ceases.

5. Should the output become short-circuited, the UPS will be locked automatically. It will then provide visual and audible alarms and cut the output supply automatically till the short circuit situation is resolved manually.

2.2. *Special Features*

1. High Frequency Transformer-less technology with rack/tower convertible enclosure enables installation in a standard 4 post rack or place on the floor using the included tower stands.

2. This UPS is equipped with fully digitalized control logic for greater functionality and enhanced power protection. Digital signal processing (DSP) also provides the UPS with powerful communication capabilities for remote control and monitoring.

3. Wide input voltage tolerance from 60V ~ 144V (110V version) or 120V~288V (220V version) allows under-voltage or over-voltage correction without unnecessary battery drain and helps extend the battery life span.

4. DC-start function ensures the start-up of UPS even during power outages.

5. Revolutionary battery management circuit analyzes battery discharging status to adjust battery cut-off point and extend the battery life span.

6. Active Power Factor Correction (PFC) control function constantly maintains the UPS Input Power Factor (PF) at > 0.99 for high energy efficiency.

7. Selectable Bypass input voltage tolerance (Sensitivity low/high) to prevent under or over voltage being supply to the loads at Bypass mode. The selectable Voltage ranges are (i) Sensitivity Low：90/180~130/260V and (ii) Sensitivity High：97/194~130/260V.

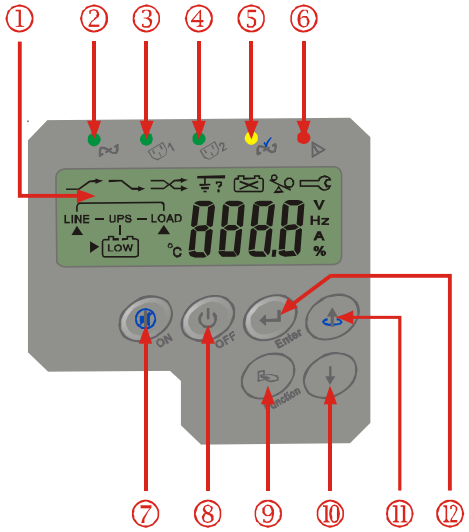
8. Selectable Output Voltages (100/110/115/120/127V or 200/208/220/230/240) to meet various voltage systems.

9. The UPS is designed to comply with stringent international standards for Electromagnetic Interference & protection (EMC).

3. UPS Functional Descriptions

3.1. *UPS Front Panel Display Descriptions*

3.1.1. LCD panel (Optional)



① LCD Display

② Green LED steadily lights up to indicate that the Utility input voltage is within the window (80Vac~144Vac, or 160Vac~288Vac); the LED flashes intermittently to indicate that the Utility input voltage is within the acceptable window (60Vac~79Vac, or 120Vac~159Vac).

③、④ Green LED lights up to indicate there is an output available at the Programmable Outlet 1 & Programmable Outlet 2.

⑤ Amber LED lights up to indicate the Bypass Input is normal.

⑥ UPS Fault LED

⑦ UPS On/Alarm Silence

⑧ UPS OFF Switch

⑨ Special functions log in/out

⑩ Go to next page

⑪ Go to previous page or change the setting of the UPS.

⑫ To re-confirm the change of UPS Setting

◎ Manual Bypass： Press "⑦ON-KEY" and "⑪Up-KEY" key simultaneously for approx. 3 seconds to transfer from "Inverter to Bypass" (the bypass led will continuously “blink“ and the audible alarm will beep intermittently) or "Bypass to Inverter", when the UPS is on Line Mode and the Bypass Voltage Window is Normal.

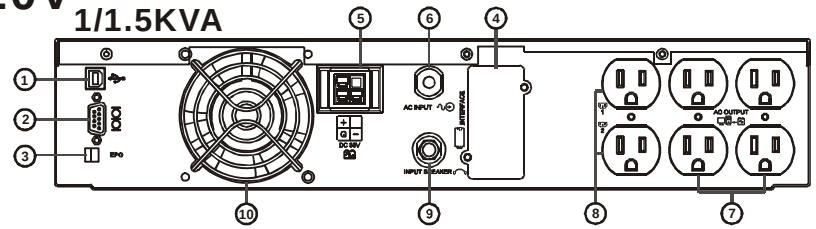
3.1.2.1 Symbols on the LCD Display Panel

Item	Symbol	Description
1	*LINE*	Utility or Bypass Source
2	LOW	Battery Low
3		Battery Abnormal
4		UPS Overloading
5		Site Wiring Fault
6		UPS Working in Service Mode
7	**OFF**	UPS Shutoff
8	**FAIL**	UPS Abnormal Lock
9	LINE – UPS – LOAD LOW	UPS Flow Chart
10	°C V Hz A %	4 Digits Measurement Display
11	▲ ▶	Indicate the item desired to be measured

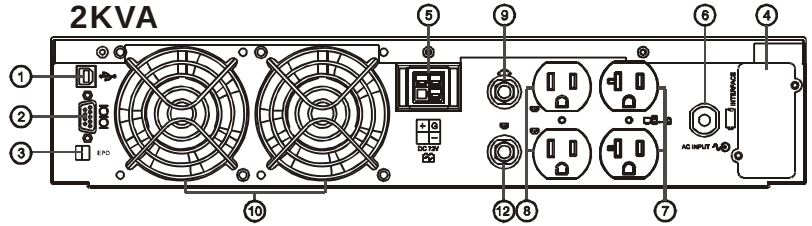
22	**Er05**	Battery Weak or Dead
23	**Er06**	Output Short Circuit
24	**Er10**	Inverter Over-current
25	**Er11**	UPS Overheat
26	**Er12**	UPS Output Overloading
27	**Er****	Other Error Code

3.2. *Real Panel Descriptions*

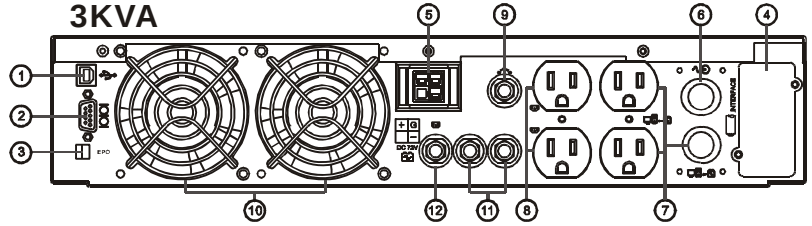
120V 1/1.5KVA



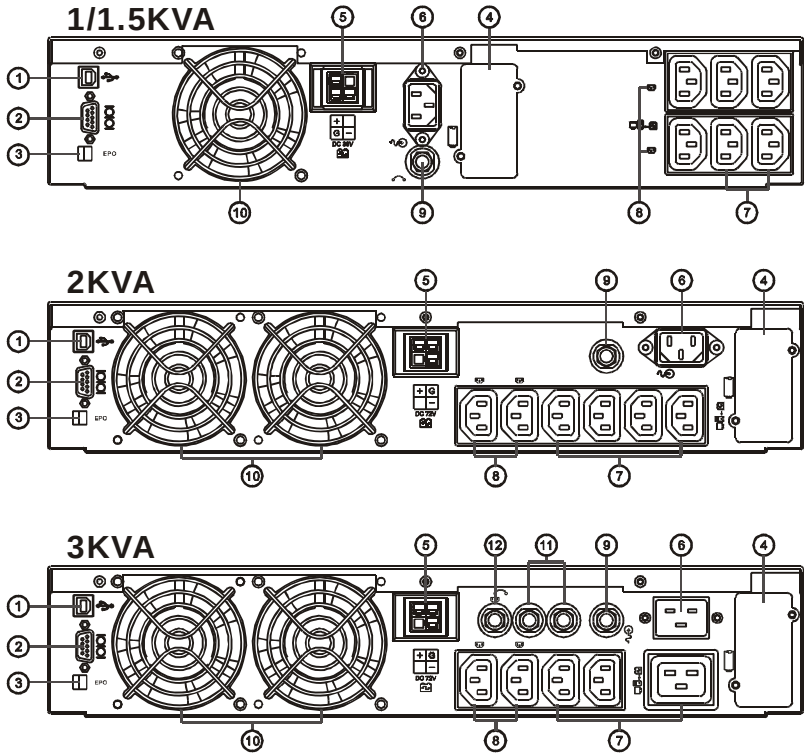
2KVA



3KVA



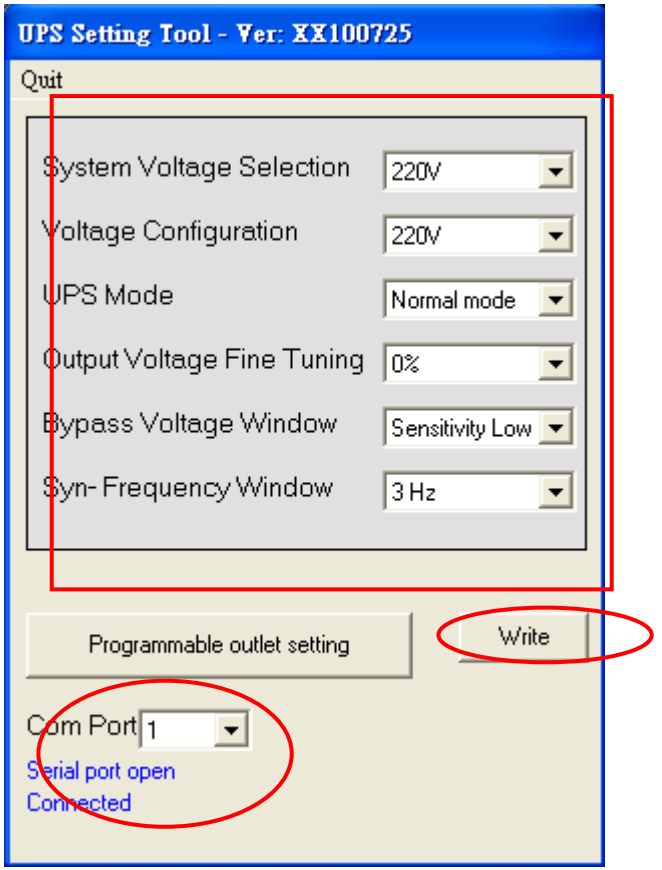
230V



1. USB Port
2. RS232 Port
3. Emergency Power Off (EPO) Dry Contact Signal inputs
4. Communication Card Options Slot
5. External Battery Connector
6. AC power connection socket
7. AC Outlets
8. Two programmable outlets
9. Utility Input circuit breaker
10. Cooling Fans
11. Output circuit breaker for two outlets
12. Output circuit breaker for two programmable outlets

3.3. *Operating Modes & Voltage System Configurations*

Download and open the “UPS Setting Tool” Software to see the screen as below



3.3.1. System Configuration Settings

1. System Voltage Selection：Select Input Voltage 110V or 220V
2. Voltage Configurations：Select UPS Output Voltage 200V/208V/220V/230V/240V or 100V/110V/115V/120V/127V
3. UPS Modes：Select Normal/CF50*/CF60* Mode
4. Output Voltage Fine Tuning：Output Voltage Regulation from 0～±3%

5. Bypass Voltage Windows：Sensitivity: Select Sensitivity Low/Sensitivity High**

	Sensitivity Low	Sensitivity High
110V System	90V～130V	97V～130V
220V System	180V～260V	194V～260V

6. Syn-Frequency Window：Select 3Hz/1Hz Inverter Freq synchronizing range
7. Com Port：Select the Com Port of PC
8. Click on “Write” to confirm the configuration settings. The UPS will beep twice to acknowledge setting is successful.
9. After setting changes are complete, turn off the UPS and unplug the input power cord from the AC Power Utility receptacle. Wait 30 seconds, then reconnect the input power cord into the AC Power Utility receptacle and turn on the UPS, referring to the section 4.4 Operation. The UPS will restart using the new settings.

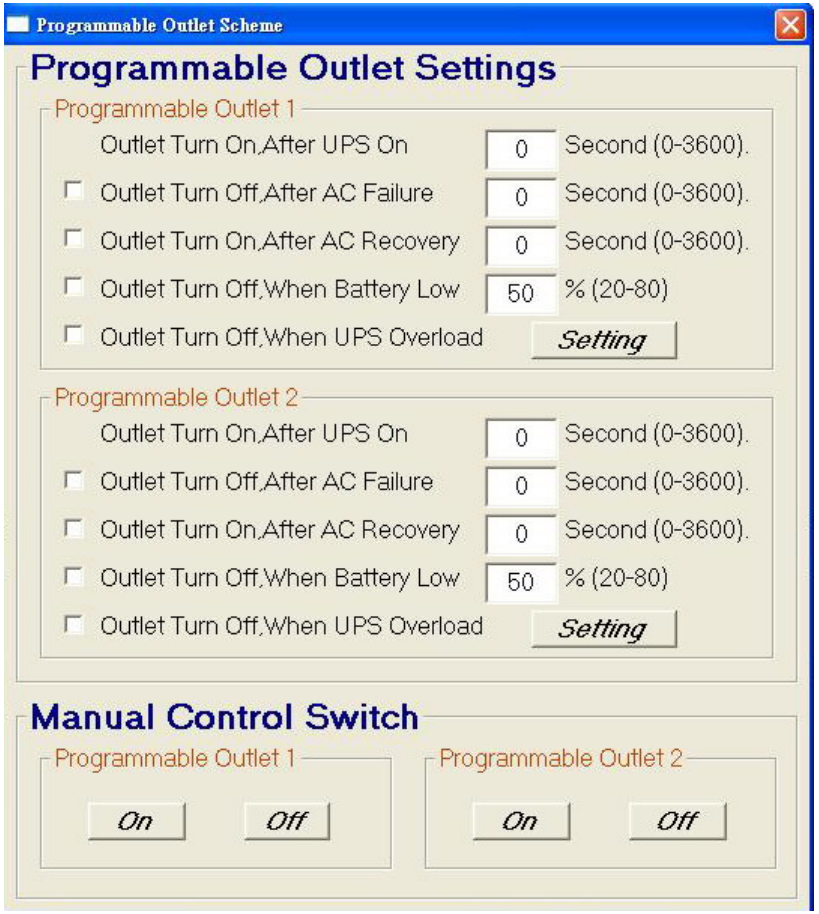
Note:

***CF50/CF60 = Frequency Converter mode 50 to 60Hz or vice versa**
****Sensitivity Low：90/180~130/260V, High: 97/194~130/260V**

3.3.2. Programmable outlet setting

The UPS is equipped with 2 programmable outlets to supply less critical loads. These outlets can be disabled to shed the less critical loads during back-up modes or overload conditions to maintain quality power supply to the more critical loads connected to the UPS.

Click on the “Programmable outlet setting” bar to enter to the setting screen as shown below.



1. Outlet Turn On After UPS on – *select the time to automatically enable this outlet within the specified time when the UPS is powered on. If "0" sec is selected, the outlet will be enabled once the UPS is powered on*.

2. Outlet Turn Off After AC Failure – *select this option to automatically disable the outlet within the specified time after utility outage to shed the less critical loads to provide longer battery back-up time for the other more critical loads connected to the UPS.*

3. Outlet Turn On After AC Recovered – *select this option to automatically enable the outlet within the specified time after the utility is restored.*

4. Outlet Turn Off When Battery Lower than - *select this option to automatically disable the outlet at the specified remaining battery power capacity(%) during battery mode to shed the less critical loads to prolong battery back-up time for the other more critical loads connected to the UPS.*

5. Outlet Turn Off, When UPS Overload – *select this option to automatically disable the outlet during overload condition (bypass mode) to possibly allow the more critical loads:*
   a) To be continually supplied via Bypass without shut down

6. Select the "Setting" menu to configure new parameters. The calibration is confirmed successfully after the UPS beeps twice. After settings changes are complete, turn off the UPS and unplug the input power cord from the AC Power Utility receptacle. Wait 30 seconds, then reconnect the input power cord to the AC Power Utility receptacle and turn on the UPS, referring to the section 4.4 Operation. The UPS will restart using the new settings.

7. Manual Control Switch – Click "On" or "Off" to manually enable or disable the programmable outlets, overriding all previous settings.

3.4. *Communication Port Explanation*

The UPS is equip with EPO dry contacts input, true RS232 and USB Communication ports to provide communication with the included software for remote monitoring of the UPS status via PC.

There are 4 other optional interface cards available to meet various communication needs, i.e. DCE (dry contact relay card) 、R2E、USE and SNMP/WEB card (Please consult Ch8).

The included software is compatible with many operating systems such as Windows 98, 2000, ME, NT and XP. For other applications such as Novell, NetWare, Unix, Linux, please contact your local dealer for suitable software.

All the communication ports (including optional cards) can be active and used simultaneously to monitor the UPS status. However only 1 communication interface at any one time with the highest priority has the ability to command and control the UPS. The priority of these communication interfaces are as follow:

Highest Priority (in descending order),

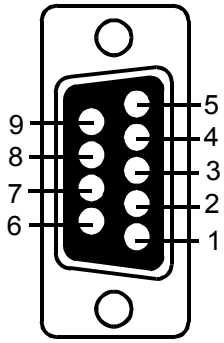
1) EPO input port
2) Optional Interface card
3) USB
4) RS232

3.4.1. True RS232 Port Descriptions

The RS232 interface shall be set as follows：

Baud Rate	**2400 bps**
Data Length	**8 bits**
Stop Bit	**1 bit**
Parity	**None**

The Pin Assignments of the true RS232 port are illustrated as follows：

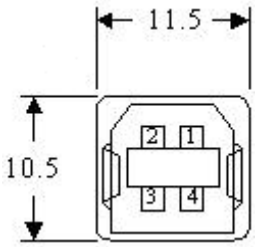


Pin 3: RS232 Rx
Pin 2: RS232 Tx
Pin 5: Ground

3.4.2. USB Port Descriptions

The USB communication protocol definition as below：

1. Complies with USB version 1.0, 1.5Mbps
2. Complies with USB HID Version 1.0.
3. The Pin Assignments of the USB port:



1 → VCC (+5V)
2 → D－
3 → D＋
4 → Ground

3.4.3. EPO

The Pin assignments of the EPO Input port are:

1	2

1 → EPO+
2 → Ground

To enable the EPO function, please short Pin 1 & 2.

4. Installation and Operation

Read the Safety Instruction guide (page 2 to 3) before installing the UPS

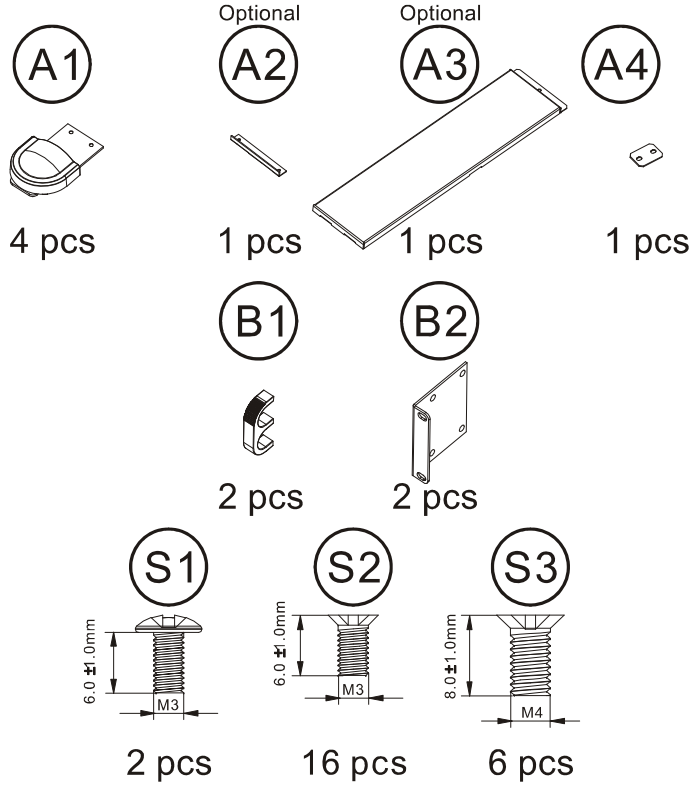
4.1. *Unpacking*

Inspect the UPS upon receipt. Accidents and damage may occur during shipment. Please notify the dealer immediately if there is damage.

The packaging is recyclable; save it for reuse or dispose of it properly.

Remove the UPS from the carton box.
Check the package contents. Standard content shall includes：

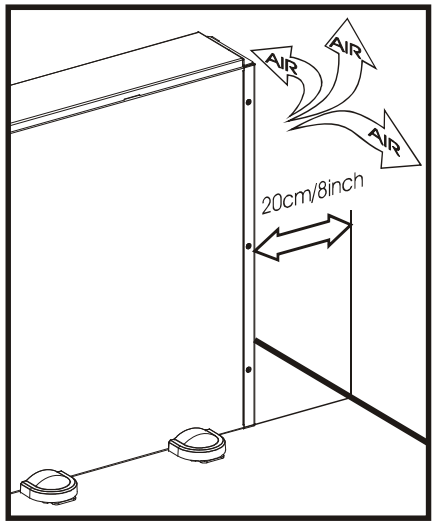
- **1 User Manual**
- **2 pcs of IEC output cables (for UPS with IEC sockets only)**
- **1 pc of detached AC Input Power Cord (for UPS with IEC sockets only)**
- **1 set of UPS communication software with RS232 cable**
- **1 set of Tower/Rack Accessories Kit as below:**



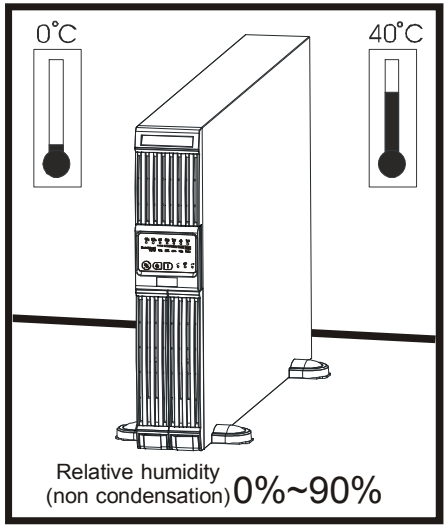
4.2. *Selecting Installation Position*

The UPS is heavy. Select a location sturdy enough to handle the UPS weight.

To ensure proper operation and long operating life, always position the UPS according to the following requirement：



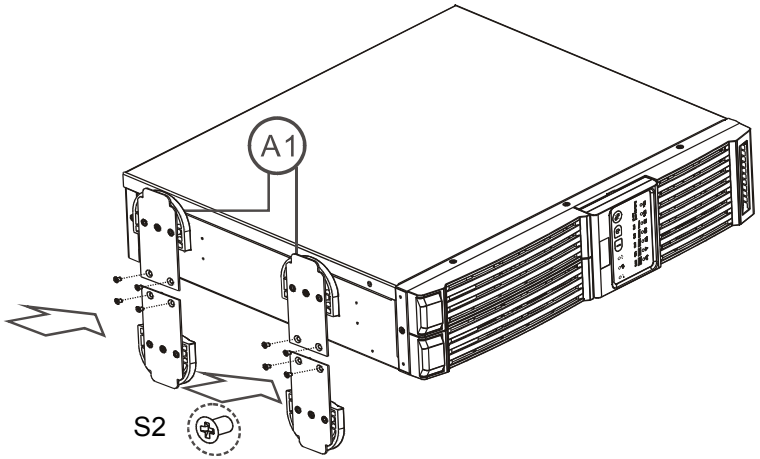
1. Keep minimum 20cm (8 inches) distance clearance from the rear panel of the UPS to avoid any obstructions.
2. Do not block the air-flow to the ventilation louvers of the unit.
3. Please ensure the installation site is free from excessive dust and the ambient temperature and humidity should be within the specified limits.
4. Do not place the UPS in a dusty or corrosive environment or near any flammable objects.
5. This UPS is not designed for outdoor use.



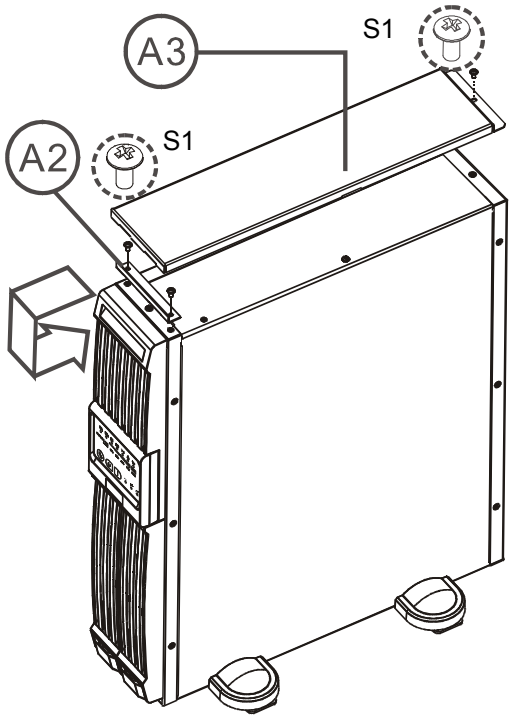
4.3. *Set up*

Tower Configuration Setup

Step 1

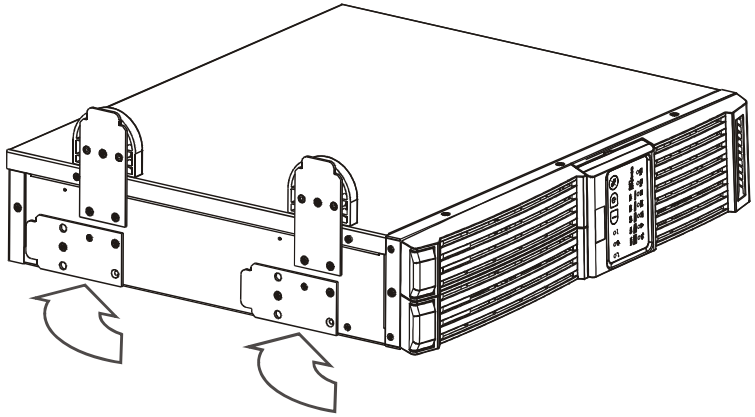


Step 2

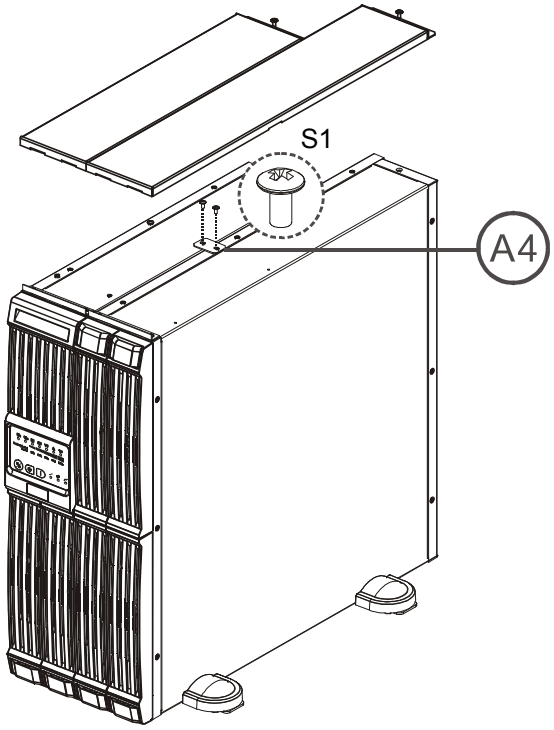


Power Module + Battery Module

Step 1

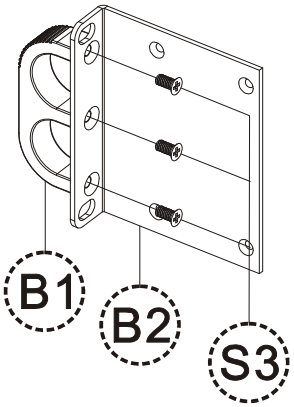


Step 2

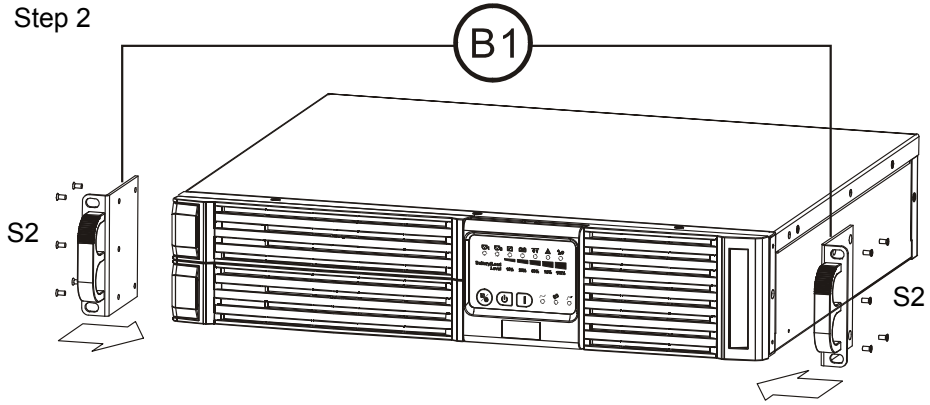


Rack-Mount Configuration Setup

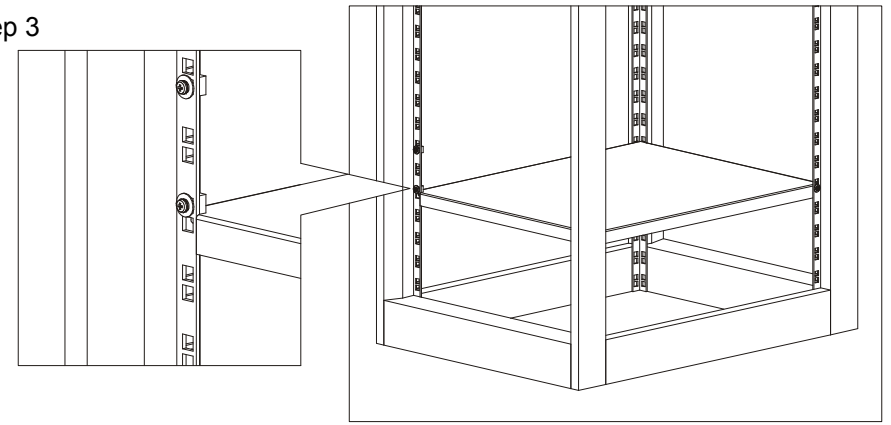
Step 1



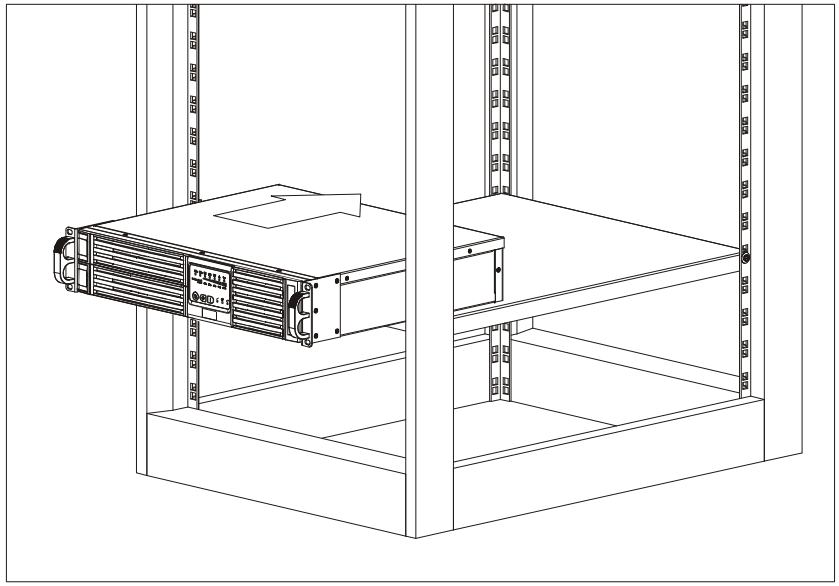
Step 2



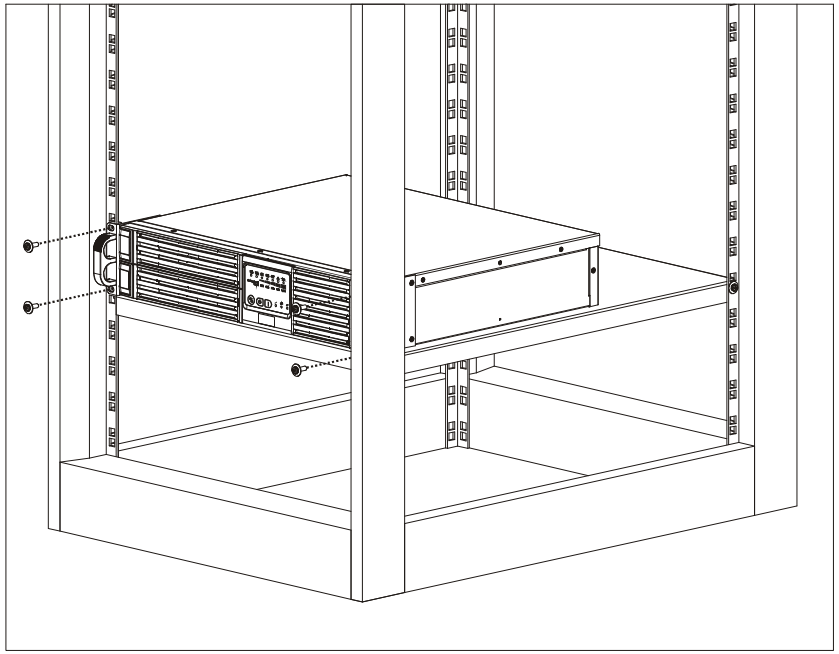
Step 3



Step 4



Step 5



4.4. *Operation*

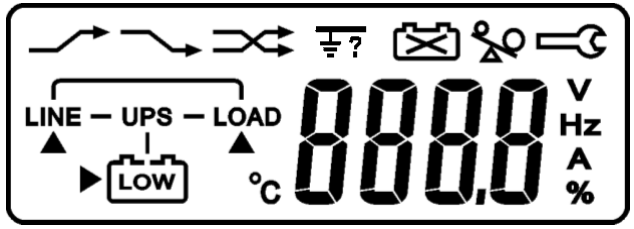
4.4.1. LCD panel

4.4.2.1 Start Up In Normal Mode

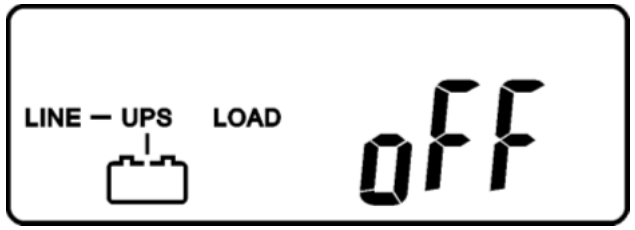
(1) Make sure the voltage of Utility matches with the input voltage window of the UPS.

(2) Connect the UPS to the wall Receptacle of the Utility. Turn on the ‘’ “ON” switch to start up the UPS. LED and light up to indicate the Utility and the Bypass are normal. The LCD will illustrate from drawing A to drawing B.

A



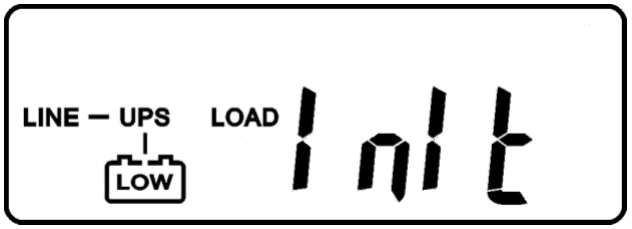
B



(3) Then, the UPS is in Bypass Mode and it will proceed to self-test automatically. If there is no abnormal message, it means the pre-startup of the UPS was successful and the charger begins to charge the batteries.

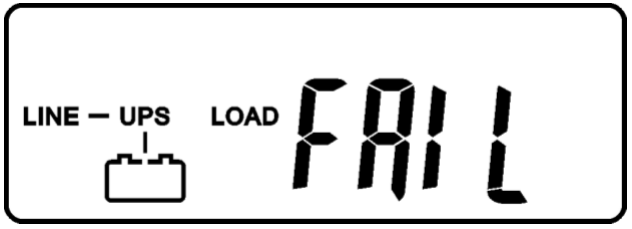
(4) Press the UPS On Switch‘ ’for approx. 3 seconds, the audible alarm beep will sound twice. If the UPS start-up is successful, the LCD display changes from drawing B to drawing C.

C

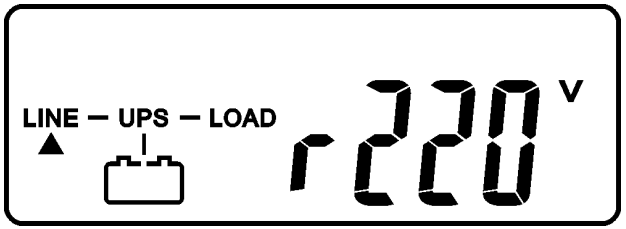


(5) In case of failure in self-test, the LCD display will illustrate as drawing D, then, an error code or error status will be shown on the screen.

D



E



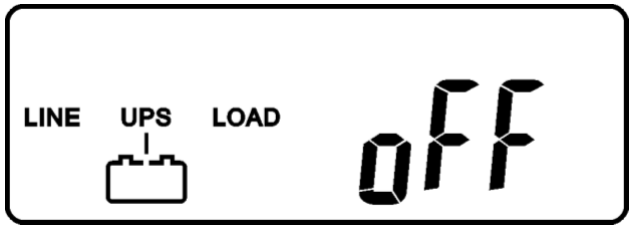
(6) Start-up of the UPS is complete as illustrated in drawing E. Make sure the UPS is plugged onto the wall receptacle to charge batteries for at least 4 hours prior to use.

4.4.2.2 Start-up in Battery Mode (Cold Start)

(1) Make sure the UPS has already been installed with batteries.

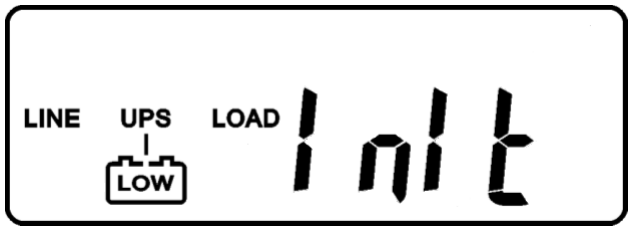
(2) Press the UPS On switch to awake the UPS for approx. 3 seconds, the audible alarm beep will sound twice. The LCD display will change from Drawing A to drawing G.

G

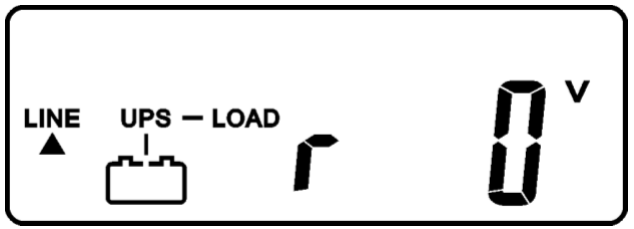


(3) Press the UPS On switch of the UPS again for approx. 3 seconds until the LCD display changes from drawing G to drawing H, then the UPS will be in self-test Mode. The UPS will provide power to the output receptacles and the LCD display will change to drawing I. In case of failure, the UPS will automatically turn off.

H



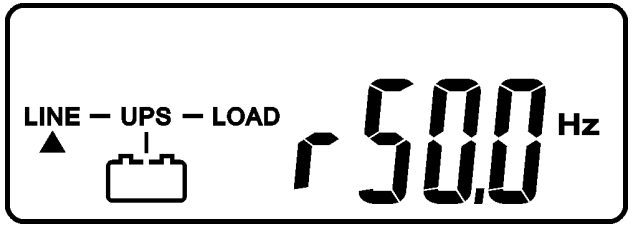
I



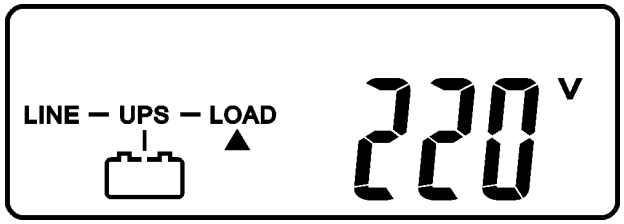
4.4.2.3 Check Measured Values & Figures detected by UPS

(1) If you would like to check the measured values & messages, please use scroll up and scroll down key pads. When you use scroll down key pad, the LCD display will illustrate in sequence from Drawing E(Input Voltage) → Drawing J(Input Frequency)→ Drawing K(UPS Output Voltage) → Drawing L(UPS Output Frequency)→ Drawing M(UPS Output Load percentage)→ Drawing N(UPS Battery Voltage) →Drawing O(UPS inner temperature

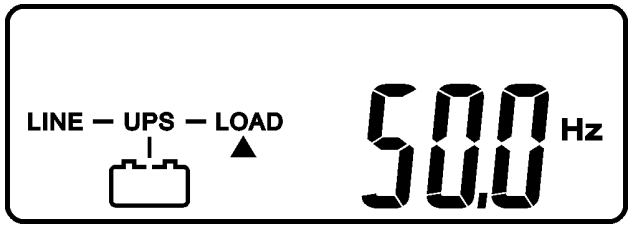
J



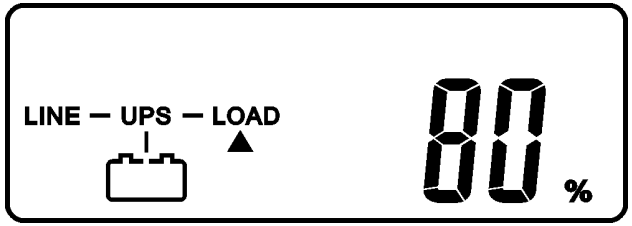
K



L

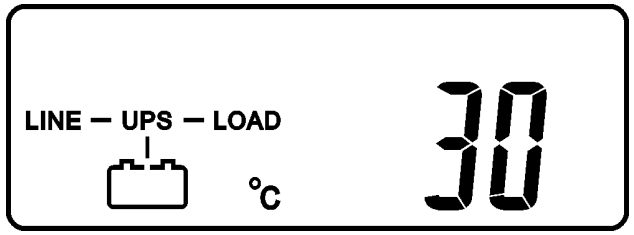


M



N

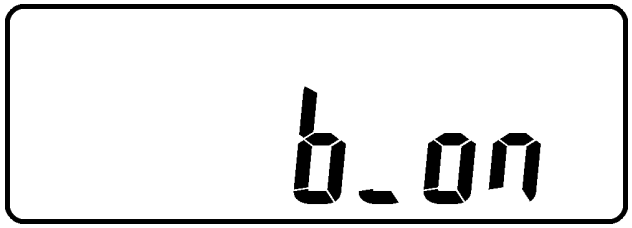
O



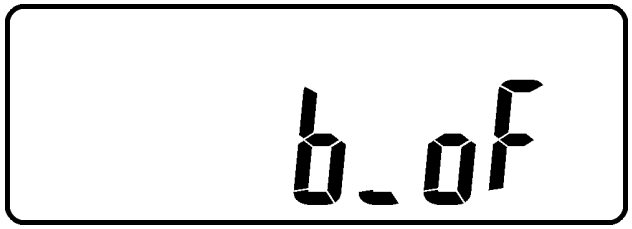
4.4.2.4 UPS Default Data and Special Function Execution

(1) After UPS is turned on successfully, use key pad to change the LCD
Display screen to drawing P1.

P1



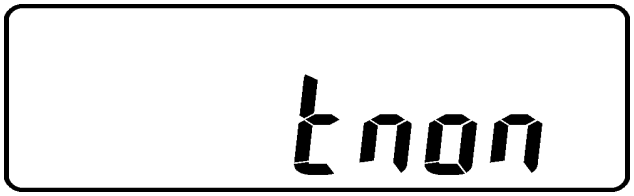
P2



(2) Press key pad to scroll down the LCD screen, then check the UPS settings. The LCD display will show in sequence: Drawing P1(audible alarm beep)→Drawing Q1(self test)→Drawing R1(Bypass Voltage)→Drawing S(Output Frequency Synchronized Window)→Drawing T(Inverter Output Voltage)→Drawing U1(UPS Operation Mode)→Drawing V(Output Voltage Fine Tuning)

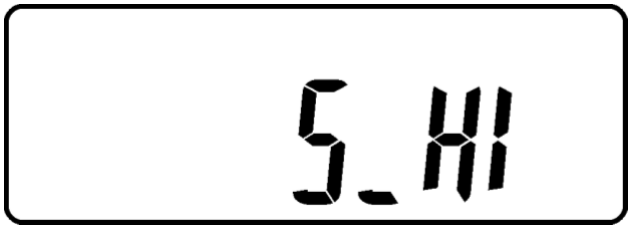
Q1

Q2



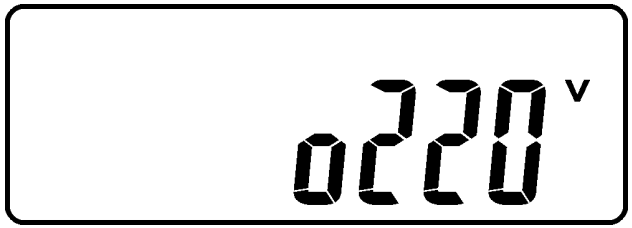
R1

R2

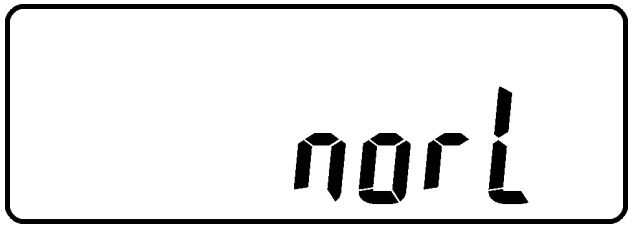


S

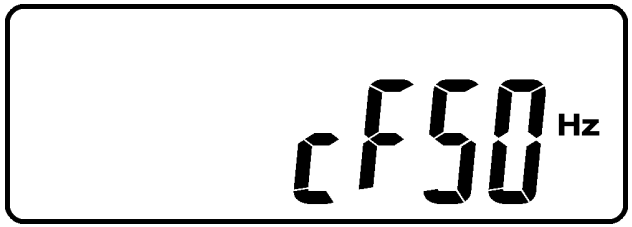
T



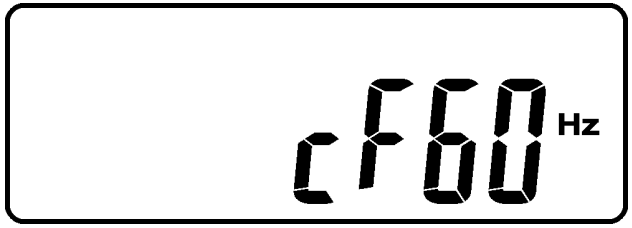
U1



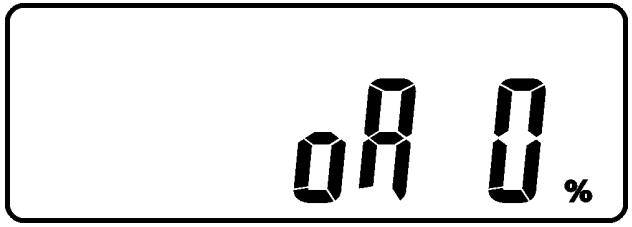
U2



U3

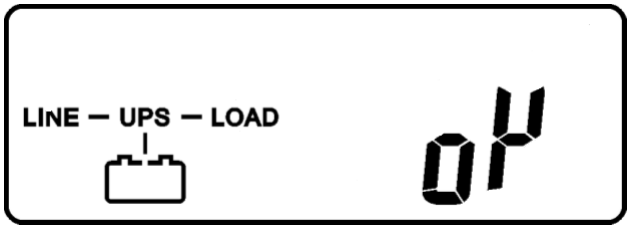


V



(3) Press scroll up key pad, you may execute special functions. The functions include Audible Alarm Beep ON (as drawing P1) or Audible Alarm Beep OFF (as drawing P2, Alarm silence for UPS warning) and self-test ON (as Drawing Q1) or OFF (as Drawing Q2. UPS will execute battery test for 10 seconds), if the self-test is successful, it will show as Drawing W; otherwise, it will show as Drawing D & error message at the same time.

W



4.4.2.5 UPS Default Settings and Their Alternatives

(1) Make sure the UPS is not "ON" yet, which means it is not in Line Mode or Backup Mode. Press on ON switch and scroll down key pads simultaneously for approx. 3 seconds, the audible alarm beep will sound twice, the LCD display screen shows as drawing P1, then the UPS is under setting mode now.

(2) To scroll down the LCD screen, you may refer to Chapter 4.4.1.3. point 1.

(3) Except Audible Alarm Beep(as Drawing P1 & P2) and self-test(Q1 & Q2), all the rest default settings may be changed by pressing scroll up key pad.

(4) Drawing R1 and R2 mean the bypass input acceptable window, it can be 180Vac~ 260Vac for 220Vac system, 90Vac~130Vac for 110Vac system or 194Vac~260Vac for 220Vac system, 97Vac~130Vac for 110Vac system.

(5) Drawing S means the bypass frequency window of the inverter output, the acceptable setting values are +/-3Hz and +/-1Hz.

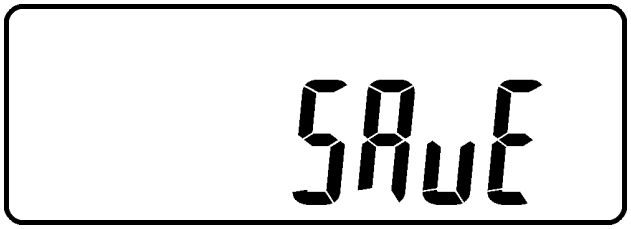
(6) Drawing T means the acceptable Inverter Output Voltage, of which voltage is 200V, 208V, 220V, 230V, or 240V for 220Vac system , or 100V, 110V, 115V, 120V and 127V.

(7) Drawing U1, U2 and U3 mean the operation modes of the UPS, of which alternative is Online, fixed 50Hz Output or fixed 60Hz Output.

(8) Drawing V means the adjustments of the Inverter Output, which may be calibrated as 0%, +1%, -1%, +2%, -2%, +3%, or -3% ◦

(9) When all the setting changes are done, you have to press enter key pad to save all the changes when the LCD screen shows as drawing X. All those changes will be activated only when the UPS is re-turned on. The LCD screen will be back to the original screen before setting.

X



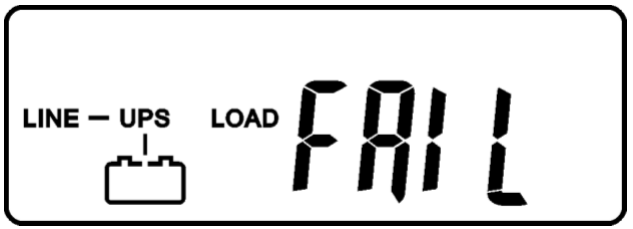
(10) Turn off the UPS and the input breaker of the Utility.

(11) Your Setting changes are complete.

4.4.2.6 UPS Is Off Due to Unknown Reason and Needs Trouble Shooting

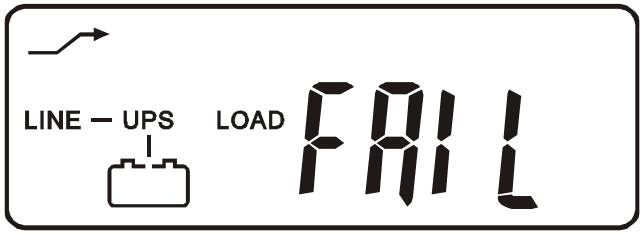
(1) If there is a serious abnormal condition that has occurred, the UPS will lock itself as shown in the drawing Y and an abnormal message will show in the LCD screen.

Y



(2) In most abnormal conditions, the UPS remains in bypass output; however, when it is out of the bypass window, the UPS will be locked and the abnormal status will be shown as drawing Z on the LCD screen.

Z



(3) To release the UPS lock, follow the steps below:

(a) Check the recorded error messages

(b) Check Chapter 6.2 to troubleshoot the problem; otherwise, consult your local distributor for service.

(c) Press key pad for 5 seconds and audible alarm beep will sound twice.

(d) Turn off the Breaker of the Utility Input.

(e) The UPS lock problem should be resolved.

4.4.2.7 Shut Off

(1) Press ⏻ key pad for about 5 seconds, the Inverter output will be turned off, the UPS will stop supplying power to the outlets and the LCD screen shows as drawing B.
(2) Turn off the input of the UPS.
(3) The UPS is turned off completely.

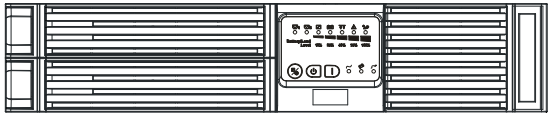
4.4.2. Status and Audible Alarm Beep

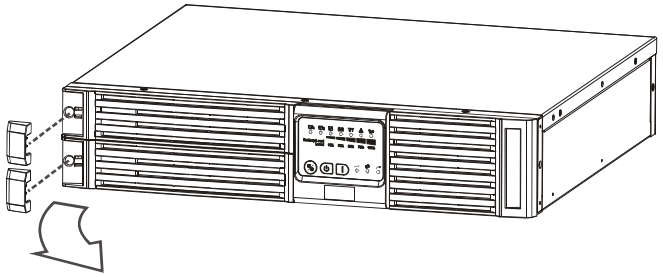
The following table helps to define some of the common UPS statuses with respect to their audible alarm beep descriptions.

Status Definitions	Audible Alarm Beep Descriptions
UPS faulty, Inverter shutdown. All functions disabled.	Long Continuous Beep
UPS faulty, loads continue to be supplied via Inverter or Bypass.	Single successive beep with ~ 2 sec interval
battery mode	Single short successive beep with ~1 sec interval
battery low	Very quick and short successive beep
confirm/RS232 port receiving	2 quick & short beeps
service mode ok	1 quick & short beep
UPS initially starts up with self test	2 successive quick & short beeps, repeating per ~2 sec interval.

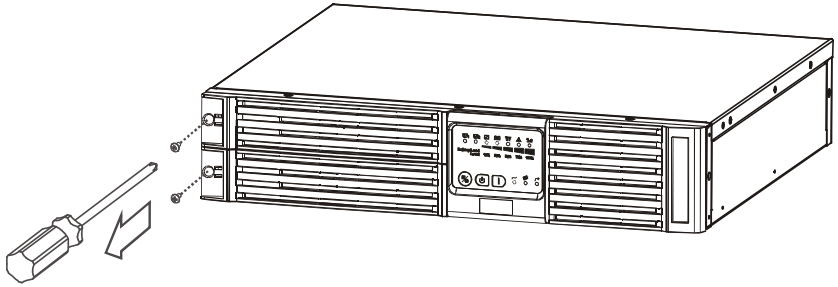
4.4.3. Battery Replacement

Step 1

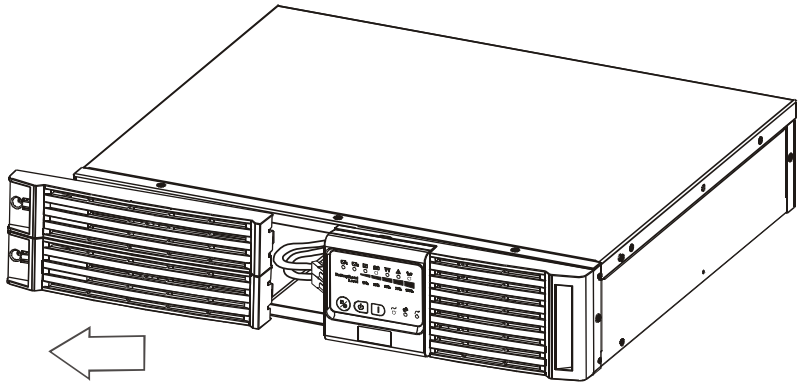




Step 2

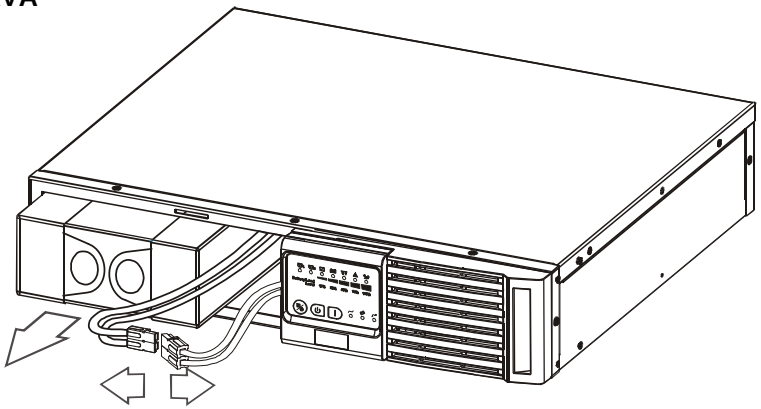


Step 3

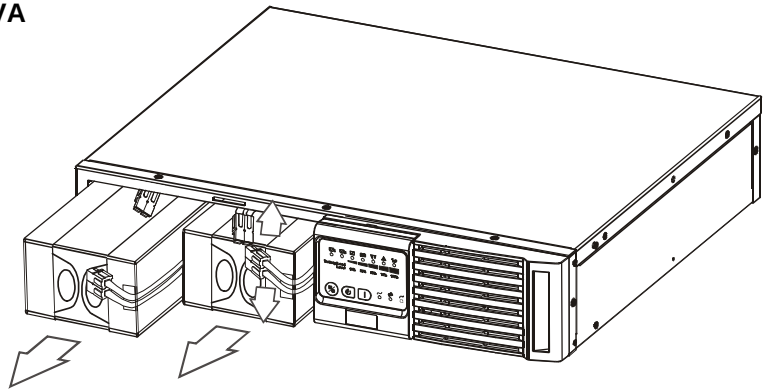


Step 4

1/1.5KVA

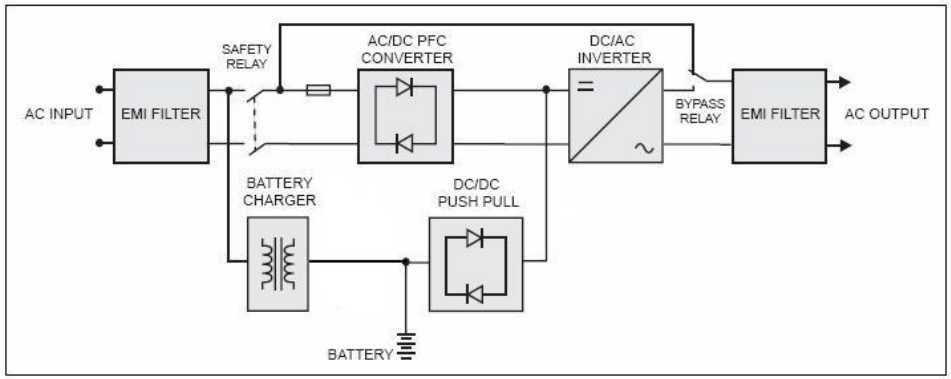


2K/3KVA



5. UPS Working Principle

5.1. *UPS System Block Diagram*



(fig 5.1)

Figure 5.1 above illustrates the True On-Line Double Conversion architecture of the UPS system. The major modules consist of：

1) An AC to DC power converter (Rectifier) with PFC control circuit
2) A DC to AC power high frequency inverter
3) An Intelligent Battery Charger
4) A bank of stationary maintenance-free batteries
5) A DC to DC push/pull converter control circuit
6) A Static Bypass Loop
7) Input & Output EMI Filter

The table below provide a summery guide to the UPS operating modes against the Utility AC Power Source conditions

Utility Conditions	UPS Operating Modes	LEDs Display indications
Utility Normal	Rectifier convert AC to DC, battery charging, Inverter convert DC to AC and supply to loads with clean & stable power.	~, 1, 2 LEDs remain illuminated
Utility Abnormal (under or over voltage) / Absent	Rectifier and charger stop operating，Battery discharge via DC~DC boost circuit and supply to Inverter. Loads continue to receive supply from Inverter. Alarm buzzer beeps, UPS now on battery mode.	~ LED off, LED illuminated
Utility Abnormal/Absent, Battery low voltage	Rectifier and charger stop operating，Battery discharge via DC~DC boost circuit and supply to Inverter. Alarm buzzer beeps with quick & short succession, indicating battery power low and Inverter may stop supply soon.	~ LED off, & ⚠ LED illuminated.

Paragraph 5.2 ~ 5.7 below provide detailed descriptions of the UPS operating principle

5.2. *When Utility is Normal*

The working principle of the UPS under Utility normal condition is illustrated as follows：

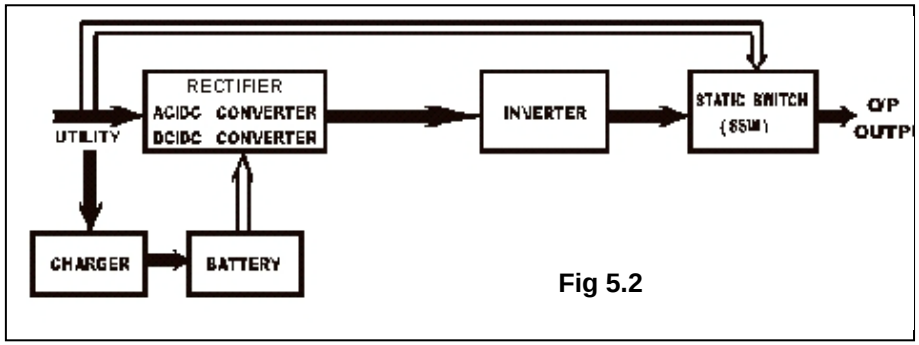


Fig 5.2

When Utility is normal, the AC source is rectified to DC, which is fed into the inverter. The charger will turn on automatically to charge batteries. The inverter converts the DC to a cleaned and pure AC to supply energy to the load connected. The ~, 1, 2 LEDs illuminated.

5.3. *When Utility is Abnormal/Absent*

The working principle of the UPS under Utility abnormal condition is illustrated as follows：

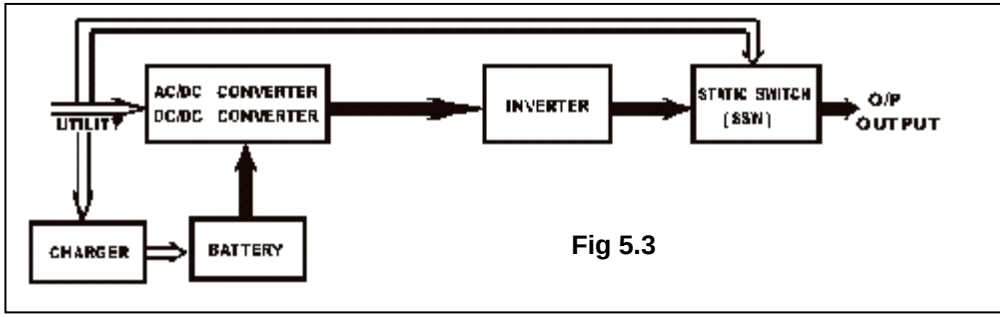


Fig 5.3

1. When Utility is abnormal, the UPS will direct the battery energy automatically to the Inverter without delay, and turn off the charger and AC/DC converter. The inverter converts DC to AC to supply energy to the output load connected without interruption. The LED will be illuminated.

2. When Utility is back to Normal, the UPS will turn on the AC/DC converter, turn off DC/DC converter and switch the charger to charging mode. It has the same working principle as figure 5.2.

3. During a utility outage, the UPS will work as illustrated in figure 5.2. When the battery is low, the audible alarm will beep continuously until the battery is drained. The battery low voltage protection of the UPS will cut off the battery supply after a preset threshold to protect the battery from being over-discharged. The & (Battery Low) LEDs will light up till the UPS is completely off. The UPS will re-start automatically when utility is available.

5.4. *Overload Condition*

The working principle of the UPS when overloading is illustrated as follows：

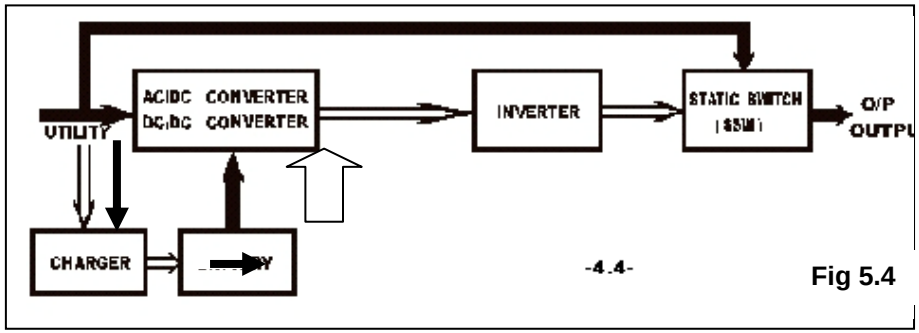
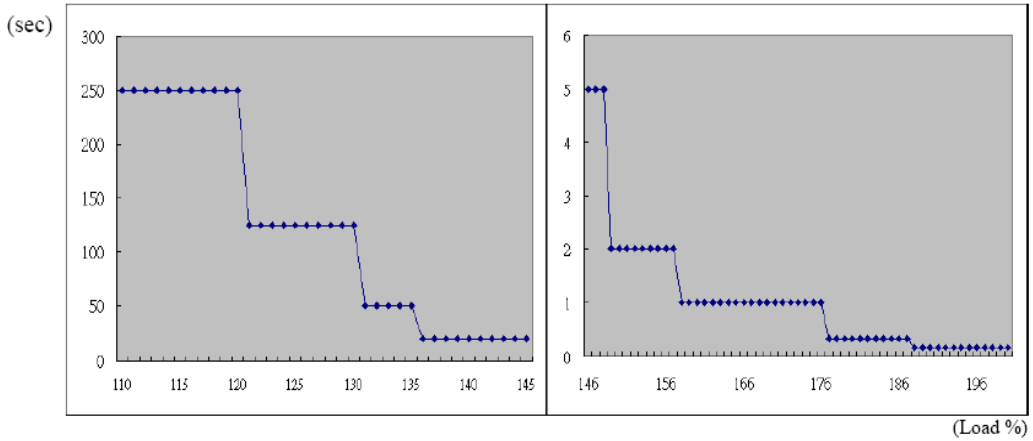


Fig 5.4

1. Generally modern day electronics and IT equipment generate an inrush current when switching on. The amount of inrush current varies – it can be as high as 6 times its rated capacity while other equipment produces negligible inrush. To prevent severe damage to the Inverter caused by current inrush, the UPS is equipped with an electronics overload protection feature as standard. If the UPS loading is >105~120% of its capacity, it will switch to bypass mode in 30 seconds to protect the Inverter. If overload condition is eliminated by reducing the load to <105%, the UPS will switch back to On-line mode automatically. If the UPS is above 150% over-loaded, the inverter will shutdown immediately.

2. The UPS Bypass loop is also equipped with overload protection. Its overload capacity is illustrated by the graph & table below.



Load（%）	110～120	121～130	131～135	136～145	146～148	149～157	158～176	177～187	188<
Delay Time （Sec）	250	125	50	20	5	2	1	0.32	0.16

5.5. *Inverter Failure*

Output Load short circuit when supply via inverter

If output load is short circuited while supplied via Inverter, the UPS will shutdown the Inverter automatically and stop supply to the loads. The Fault LED lights up and the audible alarm will beep continuously. The UPS will not switch on automatically after short circuit condition is eliminated. The UPS has to be re-started manually (refer to 4.5.1 ‘Start Up in Normal AC Mode’).

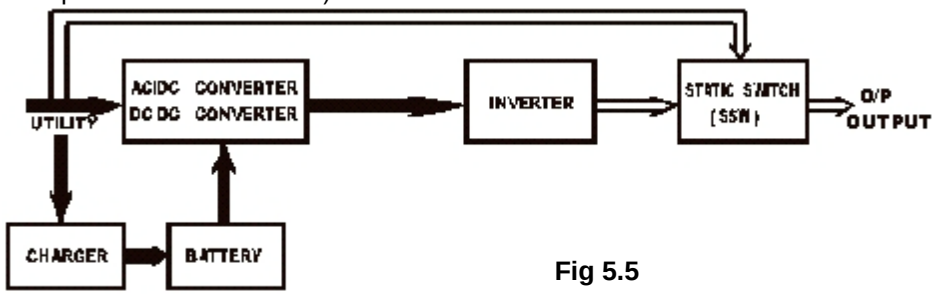


Fig 5.5

5.6. *Inverter/Internal Over temperature*

If the UPS experiences internal over-temperature when Utility is normal, it will switch to the bypass loop. The UPS will switch back to online inverter mode when the over-temperature situation is eliminated. If over temperature occurs when Utility is abnormal, the audible alarm will beep continuously and the Fault LED ⚠ will light up. The UPS will cut off supply to the loads.

5.7. *Inverter Over-Current and Inverter Output Voltage Out of tolerance*

If the UPS inverter delivers over-current and out-of-tolerance voltage to its outlets, the UPS is faulty. The UPS will switch to bypass loop when Utility is normal. The Utility ~ LED, Bypass LED and Fault ⚠ LED will light up.

If these two fault conditions occur when Utility is abnormal, the UPS will cut off the supply to its outlets and the Fault ⚠ LED will light up.

6. Maintenance Guide

6.1. *Trouble Shooting*

When the UPS becomes faulty or malfunctions during operation, you may check the fault lists below for respective solutions. Should the problem persists, please contact technical support for assistance.

Situation	Check Items	Solution
UPS Fault ⚠ LED Read the error code (see next page for error readings) displayed by the combinations of the LEDs and verify the fault as follow:	1.Er05,	1. Check battery connection if is properly done. Measure Battery voltage to ensure batteries are charged or healthy. Recharge batteries for 4 hours if necessary. Simulate Utility outage to verify if UPS is able to provide DC back-up. Otherwise consult technical support right away.
	2. Overload	2. Disconnect some non critical loads from the UPS output until overload ceases. Check if there is any short circuit between cables due to a broken cable insulator. Replace the cables if necessary.
	3.Er11 (UPS Over Temperature)	3. Remove any objects obstructing the ventilation louvers. Verify if the cooling fans are working properly. Contact manufacturer to replace the fans if necessary.
	4.Site wiring/Ground fault	4. Verify if the “L” & “N” phase of the Utility AC source has been wrongly wired or if the Ground-Neutral Voltage exceeded the limits
	5.Er14 (Fans out of order)	5. Verify if the ventilating fans are functioning properly. Do not attempt to replace the fans by yourself. Contact manufacturer for replacement.
	6.Other error codes	6. Consult technical support for assistance.

UPS fails to provide battery backup or its back up time is shorter than it's expected performance.		If the backup time remains non-satisfactory after 4 hours of charging, please contact your local dealer or manufacturer for battery replacement.
UPS is normal but no Output to load	Check if all power cords are properly connected.	If problem persist, consult your local dealer or manufacturer for technical assistance.
The UPS switches to battery mode then back to Utility mode, when connected device is turned on. Or, the UPS switches back and forth between battery and Utility.	1. if any power strip is connected to the UPS. 2. Verify if there is any damage to the utility Wall Receptacle or if the cable cord plug is faulty.	1. Do not use power strip. 2. Replace the wall receptacle/cable cord plug.
Strange noise and smell		Immediately shut down the whole System. Disconnect the power from the UPS and call for service.
UPS is unable to provide backup power source		Check that the battery connectors are fully engaged. Allow the battery to recharge if the batter is weak. If problem persists after recharging, replace the battery. If problem persists, consult your local dealer or manufacturer for technical assistance.

Note：

LCD Panel：

If an abnormal condition has occurred, the Fault LED ⚠ will be illuminated and the audible alarm will beep. An error message will be shown on the LCD screen if you press the "OFF" key. Do not press the "OFF" key for over 5 seconds because it will trigger the shut off procedure. Please proceed to section 6.2. for troubleshooting.

6.2. *Error Codes and Their Descriptions*

Code	Descriptions
Er05	Battery weak or faulty
Er06	Output short-circuited
Er07	EPO mode
Er11	UPS over-temperature
Er12	Inverter overload
Er14	Fans out of order
Er18	EEPROM's data error
Er24	Utility Low（<85/170V）& Battery Disconnect
Er28	Bypass overload
Er31	EEPROM's data not conform to the Jumper Setting

6.3. *Maintenance*

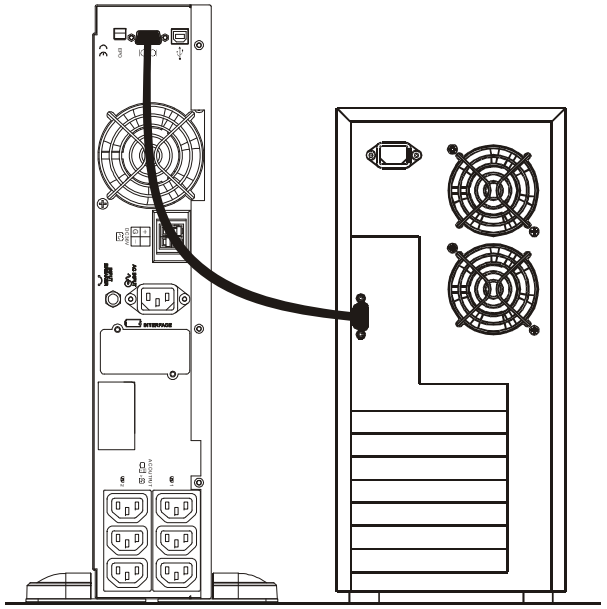
Clean the dust from the ventilation openings and intakes on the rear panel.

1. Turn off the UPS and wipe the casing with a damp cloth.
2. Periodically unplug the power cord of the UPS from the wall receptacle to test the batteries condition. If connected to a computer, ensure you have already saved your work before you proceed with the battery test.

7. Software Installation Guide

7.1. *Hardware Installation*

1. Connect the male connector of RS232/USB* cable to the UPS communication port.
2. Connect the female connector of the RS232/USB* cable to a dedicated RS232 port of the Computer.
3. For optional interface cards, please refer to Chapter 8 for more details.



***Note: Only RS232 cable is provided with the UPS. USB cable is optional**

7.2. *Software Installation*

Please refer to the user manual of the bundled software CD_ROM for installation guide.

8. Optional Communication Cards

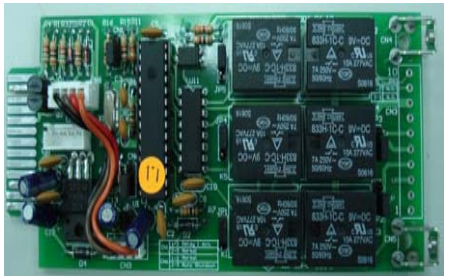
8.1. *R2E (2nd RS-232) card*

8.1.1. CN1 is for RS232 DB9.
8.1.2. For communication protocol, please refer to Chapter 3.4.1.
8.1.3. Installation Position: Optional Slot.

8.2. *USE (USB) card*

8.2.1. CN1 is for USB.
8.2.2. For communicaiton protocol, please refer to Chapter 3.4.2
8.2.3. Installation Position: Optional Slot

8.3. *DCE (Dry Contact) card*



8.3.1. The pin assignments of 10-Pin Terminal：

1	2	3	4	4	5	6	7	8	9	10

1 → UPS on Bypass mode (Bypass)
2 → Utility Normal (Normal close contact)
3 → Utility Normal (Normal open contact)
4 → Inverter On
5 → Battery Low
6 → Battery Bad or abnormal
7 → UPS Alarm
8 → Common
9 → Shutdown UPS positive(+) signal
10 →Shutdown UPS negative(-) signal

8.3.2. The shutdown function will be activated, after a +6~+25Vdc is put between pin 9 and pin 10 for 5 seconds.
8.3.3. The capacity of each relay contact is 40Vdc/25mA.
8.3.4. Installation Position: Optional Slot.
8.3.5. Flexible signal output for N.C.(Normal Close) or N.O.(Normal Open) contact by shorting pin1-2 or pin2-3 form JP1-5.
8.3.6. The shutdown function will be enabled in 1 minute after blackout occurs if the pin1-2 of both CN1 and CN6 are shorted by cap. Or, the shutdown function can only be enabled by pin9-10 of CN3 if the pin2-3 of both CN1 and CN6 are shorted by cap.

8.4. *SNMP Cards*

8.4.1. SNMP/WEB card

8.4.1.1 For installation, please refer to the user manual attached with the card.

8.4.1.2 Installation Position：Optional Slot

8.4.2. SNMP card of Megatec

8.4.2.1 For installation, please refer to the user's manual attached with the card.

8.4.2.2 Installation Position：Optional Slot

9. Specifications

Model			1KVA	1.5KVA	2KVA	3KVA
VA Rating						
Apparent Output Power			1000VA	1500VA	2000VA	3000VA
Active Output Power		PF=0.7	700Watts	1050Watts	1400Watts	2100Watts
		PF=0.8	800Watts	---------	1600Watts	2400Watts
Power Factor			0.7/0.8			
Topology			Double conversion On-Line			
Type			Rack/Tower			
Agency Approvals			115V Models: UL, cUL, FCC 230V Models: CE			
Input						
Voltage Window		115V	60/70/80 - 144Vac			
		230V	120/140/160 - 288Vac			
Voltage Range	Base on load percentage (0~33/33~66/66~100%)					
	Low Line Transfer	115V	60/70/80Vac			
		230V	120/140/160Vac (1.5KVA not available)			
	Low Line Comeback	115V	85Vac			
		230V	170Vac (1.5KVA not available)			
	High Line Transfer	115V	144Vac			
		230V	288Vac (1.5KVA not available)			
	High Line Comeback	115V	139Vac			
		230V	278Vac (1.5KVA not available)			
Frequency			50/60 Hz auto-select, ± 5Hz			
Phase			Single phase with ground			
PF			＞0.99 at full rated linear load			
Typical Transfer Time			0 ms.			
AC Leakage current		115V	≤ 5mA			
		230V	≤ 3.5mA (1.5KVA not available)			
Surge Protection		115V	400 joules			
		230V	300 joules (1.5KVA not available)			
Output						
Output (INV. mode)	Voltage	115V	115V,adjustable to 100/110/115/120/127			
		230V	230V,adjustable to 200/208/220/230/240 (1.5KVA not available)			
	Voltage Regulation		≤± 1% until low battery warning			
	Frequency(Synchronized Range)		3Hz or 1Hz (setting by software)			
	Frequency(Battery Mode)		±0.1% (0.05~0.06Hz) unless synchronized to line			

	Current Crest Factor	PF=0.7	3:1			
		PF=0.8	2.7:1			
	Harmonic Distortion		1KVA,2KVA, 3KVA≦3% THD(Linear Load) 1.5KVA≦4% THD(Linear Load) ≦7% THD(Non-Linear Load)			
	Transient Response(ms)		＜＝60ms/±5%			
	Waveform		Pure Sine wave			
Efficiency	To AC Mode (Full load)		85%	85%	85%	88%
	To Battery Mode (Full load)		83%	83%	83%	85%
Battery System						
Backup Time(Full Load)		PF=0.7	>7min.	>5min.	>7min.	>5min.
		PF=0.8	>5min.	--------	>5min.	>4min.
Recharging Time			4 Hours to 90%			
Charging Current (Max.)			1.8A		2.16A	2.7A
Charging Voltage			41.0Vdc±0.5V		82.0Vdc±0.5V	82.0Vdc±0.5V
Hot Swappable Battery			Yes			
Internal battery			Yes			
DC leakage current			≤ 30uA (±10uA) with no AC applied and the unit in the off position			
Battery type			Sealed, non-spillage, maintenance-free, lead acid			
Transfer Time						
AC to DC			Zero			
Inverter to Bypass			2.5ms(Typical)		Zero	
DC Start			Yes			
Self Diagnostics			By button of the panel or Software Control			
Front Panel						
LED			Load Level/Battery Level/ Battery Mode/ Normal Mode/Bypass Mode/ Self-Test/ Weak/Bad Battery/Site Wiring Fault/ Fault/ Overload/Programmable Outlet1//Programmable Outlet2			
Key			ON Button/ OFF Button/ (Test/Alarm Reset Button)			

Protection		
Overload		(AC Mode) ＜105％ continuous ＞106％～120％ for 30 seconds transfer to bypass ＞121％～150％ for 10 seconds transfer to bypass ＞150％ for immediately transfer to bypass Audible alarm beeps continuously.
		(Battery Mode) ＜105％ continuous ＞106％～120％ for 30 seconds shuts down ＞121％～150％ for 10 seconds shuts down ＞150％ immediately shuts down Audible alarm beeps continuously.
		(Bypass Mode) ＜105％ continuous ＞106％～120％ for 250 seconds shuts down ＞121％～130％ for 125 seconds shuts down ＞131％～135％ for 50 seconds shuts down ＞136％～145％ for 20 seconds shuts down ＞146％～148％ for 5 seconds shuts down ＞149％～157％ for 2 seconds shuts down ＞158％～176％ for 1 seconds shuts down ＞177％～187％ for 0.32 seconds shuts down ＞188％ for 0.16 seconds shuts down Audible alarm beeps continuously.
Short Circuit		Bypass mode : Input Fuse/Input Breaker Normal Mode: Output Breaker/Electronic Circuit Battery Mode: Output Breaker/Electronic Circuit
Battery		ABDM
EPO		UPS shuts down immediately
Over Temperature	Normal Mode	Transfer to Bypass Mode
	Battery Mode	UPS shuts down immediately
Audible Alarm		
Battery Mode		Sounding once every 1.5 seconds
Low Battery		Sounding once every 0.2 seconds
Overload		Sounding once every 3 second
Fault		Continuously Sounding（or Sounding once every 3 second）

Physical					
Dimensions(HxWxD in mm)		3.5”(2U) H x 18”W x 16”D	3.5”(2U) H x 18”W x 16”D	3.5”(2U) H x 18”W x 26”D	3.5”(2U) H x 18”W x 26”D
Weights	115V	34.5lb(15.7kg)	34.5lb(15.7kg)	61.3lb(27.9kg)	68.6lb(31.2kg)
	230V	34.2lb(15.1kg)	(not available)	62.0lb(28.2kg)	65.5lb(29.8kg)
Input Connection	115V	NEMA 5-15P	NEMA 5-15P	NEMA 5-20P	NEMA L5-30P
	230V	10A, IEC 320-C14	(not available)	10A, IEC 320-C14	16A, IEC 320-C20
Output Connection	115V	5-15R×6	5-15R×6	5-15R×2 5-20R×2	5-15R×4 L5-30R×1
	230V	(6) 10A,IEC 320-C13	(not available)	(6) 10A,IEC 320-C13	(4) 10A,IEC 320-C13 (1) 16A,IEC 320-C19
Environmental					
Operation Temperature		0-40□			
Noise Level		＜50dBA			
Relative Humidity		0 to 90% (Without condensation)			
Interface					
Interface Type		1 *USB port+ 1*RS-232 port			
SNMP(optional)		Power management from SNMP manager and Web browser			
Compatible platforms		Windows 95/98/NT/2000/XP Novell NetWare, Linux, etc.			
Standards and Certification					
Safety		IEC/EN 62040-1-1,IEC 60950-1			
Performance		IEC/EN 62040-3			
EMC		IEC/EN62040-2 Class A, FCC Part 15 Subpart B Class A, IEC/EN55011, CISPR11, IEC61000-4-2/-3/-4/-5, IEC61000-2-2, IEC61000-3-2/-3			
Markings		CE,UL, cUL, FCC			

Orion Power Systems Service and Technical Support

If you have any problems or questions with the UPS, call your local distributor or Orion Power Systems technical support at the following telephone number :
In the United States: **1-877-385-1654**
Please have the following information ready when you call:
- Model number and Serial number
- Description of failure or problem
- Date of failure or problem
- Customer contact information and return address

If repair is necessary, you will be given a Returned Material Authorization (RMA) number. The RMA number must appear on the outside of the box and on the Bill Of Lading. Original packaging should be used if available. Systems that get damaged in transit as a result of improper packaging are not covered under warranty. A replacement or repair unit will be shipped, freight prepaid for all units under warranty.

NOTE: *For critical applications, immediate replacement may be available.*